

# Claims

- [c1] An integrated circuit including  
a first layer having metal or metal alloy at a surface thereof,  
a second layer adjacent to said surface having a metal or metal alloy via therein,  
an interlayer connection between metal or metal alloy of said first layer and said metal or metal alloy via comprising an alloy region restricted to an interfacial region of said metal or metal alloy of said first layer and said metal or metal alloy via by a barrier layer.
- [c2] The integrated circuit as recited in claim 1, wherein said metal or metal alloy of said first layer is a first metal and said metal or metal alloy of said second layer is a second metal.
- [c3] The integrated circuit as recited in claim 1, wherein said metal or metal alloy comprises copper.
- [c4] The integrated circuit as recited in claim 1, wherein said barrier includes a layer of tantalum, tungsten or titanium or alloys or nitrides thereof.

- [c5] The integrated circuit as recited in claim 1, wherein said barrier comprises a layer of tantalum nitride and a layer of tantalum.
- [c6] The integrated circuit as recited in claim 1, wherein said metal alloy of said interlayer connection at said interface includes tin, indium, nickel, gold, silver, aluminum, beryllium, tellurium, magnesium, zinc or zirconium.
- [c7] The integrated circuit as recited in claim 1, wherein said barrier is above said interlayer connection and said metal alloy of said interlayer connection is confined to a region below said barrier.
- [c8] The integrated circuit as recited in claim 1, wherein said metal alloy of said interlayer connection is formed as an annulus in said metal or metal alloy at a surface of said first layer.
- [c9] The integrated circuit as recited in claim 8, wherein said via extends into said metal or metal alloy of said first layer surrounded by said annulus.
- [c10] The integrated circuit as recited in claim 1, wherein said barrier is below said interlayer connection and said metal alloy of said interlayer connection is confined to a region above said barrier.

- [c11] A method of forming a connection between metal or metal alloy at a surface of a first layer and a metal or metal alloy via of a second layer, said method comprising steps of depositing an alloying material, and forming an alloy confined to an interfacial region of said metal or metal alloy at a contact surface between said first layer and said metal or metal alloy of said second layer by a barrier.
- [c12] The method as recited in claim 11, wherein said metal or metal alloy of said first layer is a first metal and said metal or metal alloy of said second layer is a second metal.
- [c13] The method as recited in claim 11, wherein said metal or metal alloy comprises copper.
- [c14] The method as recited in claim 11, wherein said barrier includes a layer of tantalum, tungsten or titanium or alloys or nitrides thereof.
- [c15] The method as recited in claim 11, wherein said barrier comprises a layer of tantalum nitride and a layer of tantalum.
- [c16] The method as recited in claim 11, wherein said metal alloy of said interlayer connection at said interface in-

cludes tin, indium, nickel, gold, silver, aluminum, beryllium, tellurium, magnesium, zinc or zirconium.

[c17] The method as recited in claim 11, wherein said barrier is formed above said connection and said metal alloy of said connection is confined to a region below said barrier.

[c18] The method as recited in claim 11, wherein said metal alloy of said connection is formed as an annulus in said metal or metal alloy of said first layer.

[c19] The method as recited in claim 18, wherein said metal or metal alloy of said second layer extends into said metal or metal alloy of said first layer surrounded by said annulus.

[c20] The method as recited in claim 11, wherein said barrier is below said connection and said metal alloy of said connection is confined to a region above said barrier.